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ABSTRACT

The three essays in this publication consider the relationship between human capital investment and economic development, particularly in the context of developing countries. The first article (by Aklilu Habte) reviews the experiences of the World Bank in lending for education, curriculum development, and vocational training. The role of education in cultural as well as economic development is considered. The second article (by George Psacharopoulos) focuses on the productivity of educational investments, examining both the monetary and nonmonetary benefits that flow to individuals and society from such investments and supporting the proposition that returns from educational investments are at least as high as the economic returns from other types of physical capital investment. The final article (by Stephen P. Heyneman) examines the productivity of education in the context of developing countries. Discussed are the minimum cognitive skills required for a farmer to operate efficiently at increasingly difficult levels of technology, and the facilities available in a typical school to deliver those skills. It is suggested that the pressure from increasing enrollments may be widening the gap in school quality between developing and industrialized nations. Despite different perspectives, each article maintains that skepticism about education, while common in developed nations, is not applicable in developing countries. A six-page bibliography concludes the publication. (LP)

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# Education and Development

## Views from the World Bank

Aklilu Habte,
George Psacharopoulos,
and Stephen P. Heyneman

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The World Bank
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# Introduction

Among scholars it is not uncommon to hear the argument that the "heyday" of the economics of education was in the 1960s. It was then that Gary Becker's *Human Capital* (1964) was published and widely read. It was during the 1960s that the popular debate opened up on the "rate-of-return approach" versus the "manpower-requirements approach." In the industrial countries, higher education was expanding rapidly, and a "sputnik psychology" helped to frame the investment decisions among politicians. Also, children and youth accounted for a substantial portion of the overall population; this influenced the demand for new teachers, new teaching technologies, and a new industry of educational research and evaluation to assess governmental programs.

The last twenty years have borne witness to increasing levels of skepticism about the role of education. Popular critics have held that schools tended to socialize students toward supporting the political status quo, for example. And new empirical lines of reasoning—using previously unavailable computer technologies—began to suggest that expensive investments in high-quality new schools would be comparatively impotent as a means to increase learning (Coleman *et al.*, 1966), and that educational attainment was, at best, a fairly imperfect determinant of occupational mobility (Jencks *et al.*, 1972). Comparisons in both these latter cases were being made against influences over which education policy was said to have little control—the advantages of family economic status, ethnicity, and "luck" in the labor market. The publication of these results coincided with two other factors: (1) demographic changes in the school-age population; and (2) the debates over the efficacy of costly educational experiments (for example, Head Start in the U.S., comprehensive school reforms in Europe, and computer-assisted instruction). All of these contributed to a retrenchment of school facilities and a general disillusionment with the capacity of education to meet the most pressing societal needs.

There are two problems associated with these debates. First, even in industrialized countries, the results of the research are subject to substantial disagreement. But even more important, the debates have taken place in political contexts representing only a portion of the world, and, in fact, a small portion of the world's school populations. The content and tone represent those societies from where the data originate, where there is a substantial amount of research and evaluation data available for analysis, a substantial level of research support, and a wide availability of analytical skills. Furthermore, these debates reflect those societies where schooling itself is abundant, even compulsory, and where the lowest 10 percent of schools in terms of quality of physical resources might be equivalent to the top 10 percent in developing countries.

## Human Capital in the World at Large

The world, of course, is much broader than Europe and North America. The question is to what extent this (current) sense of "skepticism" about education ought to apply to the world at large or, more specifically, to developing countries. Two Nobel prizes were awarded recently to A. L. Lewis and T. W. Schultz for their research on human capital. The results of their work, and the work of others, as well, strongly suggest that human capital investments would have high yields in the developing countries. Nevertheless, the question remains: What is the experience with actual investments?

These three articles represent a response. The World Bank began investing in human capital twenty years ago, in 1963. In the interim, 224 loans for education have been made in over 90 developing countries. The judgments in these articles are derived from contact with and exposure to colleagues in the countries and in the Bank who are responsible for these loans, as well as from the authors' own research and policymaking experience.

The articles themselves approach the subject from slightly different angles. Mr. Aklilu reviews the experience of the World Bank in lending for education and training, an experience that has led to a broadening of priorities over time. From an original stance twenty years ago of lending only for "manpower" development, at the request of member governments, the Bank now assists in the production of textbooks, curriculum development, computer centers, fisheries training, mechanical engineering, and many other areas critical to economic growth. Mr. Aklilu raises a question whether such justifications for investment in education are sufficient; he asks, Is it not rather the case that the role of education is critical not only in economic terms, but in terms of "national development"? By this, he means "development" in the widest sense—in culture, history, art, language, and research capacity.

Mr. Psacharopoulos is interested primarily in the productivity of education investments, in the monetary and nonmonetary benefits that flow to the individual and to society as a whole. His conclusion is that the returns to educational investments have remained high despite large increases in enrollments, and are at least as high as the economic returns from other types of physical capital investments, especially in developing countries.

Mr. Heyneman examines the reasons why education is so productive in the context of developing countries. He discusses the minimum cognitive skills required for a farmer to operate efficiently at increasingly difficult levels of technology. He also points out that the facilities available in a typical school to deliver those skills differ from one country to the next. He concludes that the pressure for increasing enrollments may be widening the gap in school quality between developing and industrialized countries, resulting perhaps in an inability to maintain even the minimal standards necessary for the productivity outcomes he discusses.

Despite their divergence, however, these articles do have something in common. Each of the authors feels that the skepticism, so common among educational authorities and critics in North America and Western Europe, whether or not it applies even there, is simply not applicable to developing countries. In

these contexts, education and training benefit the society at large in a profound way; and although the path to development (however defined) contains many other important variables, the education of the population—up to a reasonable standard of quality—is one of the very few that has proved to be essential.

## Related Reading


James S. Coleman, Ernest Q. Campbell, Carol J. Hobson, James McPortland, Alexander M. Mood, Frederic D. Weinfeld, and Robert L. York, *The Equality of Educational Opportunity* (Washington, D.C.: U.S. Department of Health, Education and Welfare, 1966).

Christopher Jencks, Marshall Smith, Henry Acland, Mary Jo Bane, David Cohen, Herbert Qintis, Barbara Heyns, Stephen Michelson, *Inequality: A Reassessment of the Effect of Family and Schooling in America* (New York: Basic Books, 1972).

Gary Becker, *Human Capital* (New York: National Bureau of Economic Research, 1964).

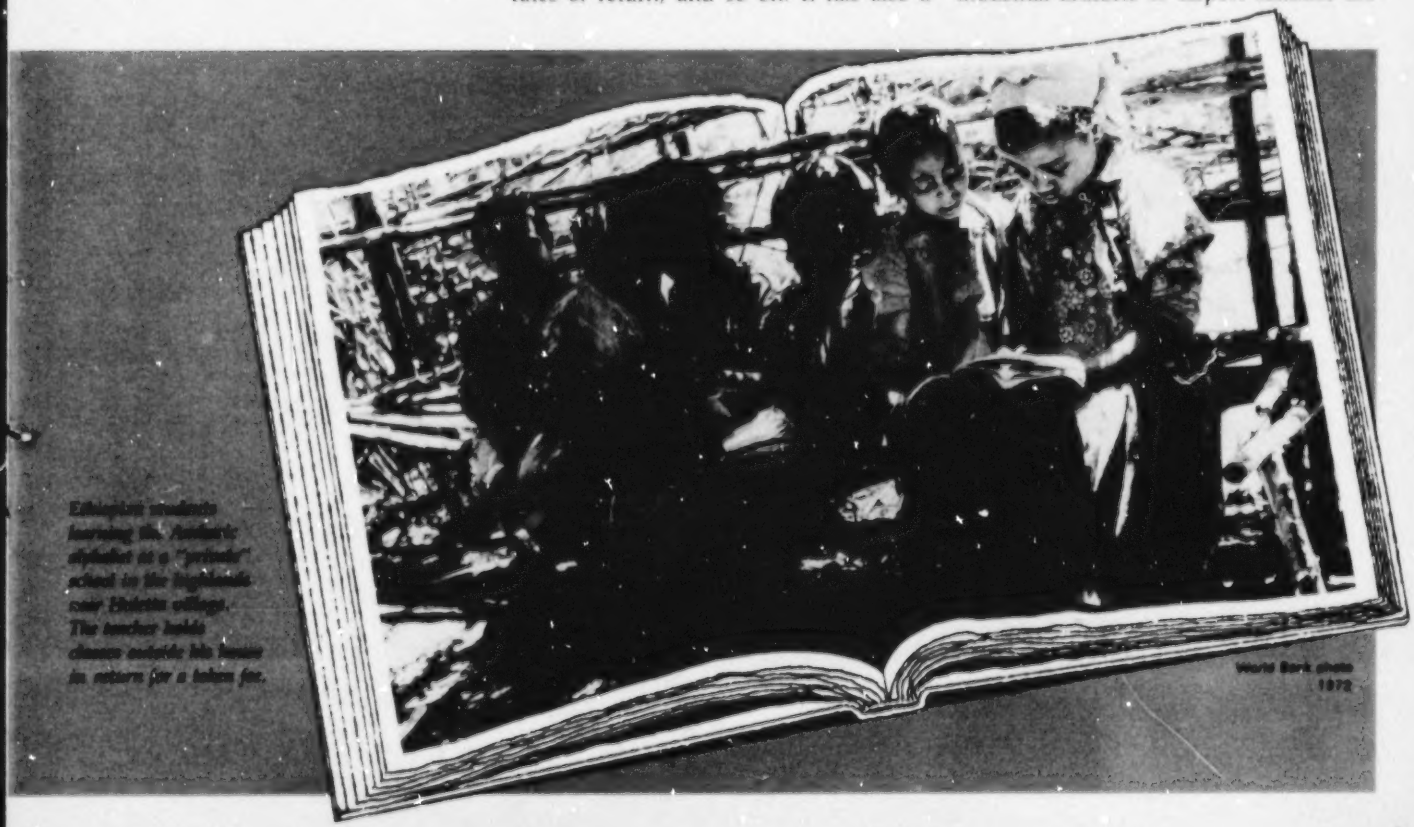
# Education and national development

How does education serve to promote the economic and the sociocultural development of developing countries? The Director of the Education Department reflects on World Bank lending for education projects in the light of diverse national objectives.

**Aklilu Habte**

Developing countries spend an increasing proportion of their scarce resources on education. Through education they seek, first, to follow the traditional path to "development" by strengthening their national capacity to acquire scientific knowledge and thereby better their economic performance. Second, they use schooling in some instances to create and in others to preserve a sense of national identity and independence that incorporates their cultural values, retaining the freedom to select different elements from foreign systems. So education is not just a means to economic development, measured by discount rates, rates of return, and so on. It has also a broader sociocultural dimension that needs to be taken into account when measuring its role in national development. The success or failure of education systems, therefore, in large part depends on the relevance of development programs to the overall needs of national societies.

The need to preserve a diversity of cultures and values is particularly urgently felt in many developing countries. Most nations, even those whose independence preceded World War II, have been heavily influenced by metropolitan models. In some, school structures, curricula, and credentials, as well as legal and administrative systems, were transferred directly. In others, such as my own country (Ethiopia), the influence was less direct. But the result is a powerful pressure to make cultures the same the world over and to multiply identical beliefs and behavioral patterns just as industrial artifacts or airport facilities are



*Ethiopian students learning the Amharic alphabet at a "private" school in the highlands near Dilanta village. The teacher holds classes outside his house in return for a token fee.*

World Bank photo 1972



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the same the world over. A certain diversity is lost, and it is not surprising that most developing countries regret this loss and want to use their education system to preserve something of their own culture.

They also need to use it to acquire, produce, and impart scientific skills and knowledge. In general, a local scientific capacity is essential to interpret and absorb foreign technology; any nation without some capacity for this function will suffer. It is also needed to avoid counterproductive activities—to know the degree to which mining waste will affect a fishing industry; the degree to which meatpacking industries hold true to their product labels; and the degree to which social programs are as economic—and as social—as their claims. As the *World Development Report, 1980* aptly stated, people who are illiterate or who are scientifically ignorant or unaware of a wider world remain essentially "untapped and are unable to contribute fully to national development."

Yet education is expensive, not only in terms of direct costs but also because of wasted resources. In many countries the environment does not encourage children to complete their educational programs. Speaking of the characteristics of primary education in one West African country, a United Nations Educational, Scientific and Cultural Organization (UNESCO) document stated:

> *Primary education accounts for 94 per cent of the total school enrollment . . . occupies about 90 per cent of all teachers, consumes 62.4 per cent of the public educational budget, covers only 13 per cent of the relevant age group, permanently carries 25 per cent of the repeaters, and has an output of 28 graduates for an input of 100 new entries at a cost of 19 pupil years.*

Acknowledging the need for education as a central element for growth, this article will review the Bank's experience with lending for education since 1963. Reflecting the diversity of its members' needs, the Bank's funds have been used in many ways—from providing more school places to developing computer facilities and teaching women about nutrition and family planning. Although the Bank lends generally for projects that show economic rates of return, the diversity of its lending reflects its concern for strengthening all aspects of human and social development. Many problems have arisen in the course of this work: expanding school systems often meant great strains were placed on budgets to pay teachers' salaries; providing technical equipment meant that it had to be maintained; and there has been too much preoccupation with single projects and too little with the long-term needs of individual countries. On the other hand, the Bank's investments in secondary schools, for instance, have shown remarkable resilience in the face of political and economic disturbances, indicating the strength of the demand for them and proving their effectiveness. For it is widely recognized that a solid educational system goes a long way toward explaining a country's success in developing productive resources and in preserving its sociocultural uniqueness.

Table 1
**Institutions assisted by World Bank education projects, 1963–81**

| Level | Student places created | Institutions assisted |
|---|---|---|
| **Primary** | **1,201,422** | **16,902** |
| **Secondary** | **1,083,801** | **2,903** |
| **Postsecondary** | **355,729** | **1,222** |
| *University* | *131,866* | *185* |
| Agriculture | 16,736 | 43 |
| Engineering | 76,540 | 48 |
| Forestry | 115 | 8 |
| General university assistance | 10,295 | 21 |
| Health science | 1,103 | 20 |
| Home economics | 0 | 2 |
| Law/administration | 180 | 2 |
| Physics/chemistry | 2,330 | 18 |
| Social science | 500 | 4 |
| Technical/commercial | 24,067 | 19 |
| *Nonuniversity institutes* | *91,721* | *386* |
| Administration/management training | 3,640 | 14 |
| Agriculture | 13,075 | 81 |
| Computer | 0 | 1 |
| Food processing training | 960 | 2 |
| Forestry | 236 | 4 |
| Health | 1,798 | 130 |
| Merchant marine | 520 | 5 |
| Operational engineering | 3,320 | 6 |
| Recurrent training (multicurricular) | 1,500 | 3 |
| Technical | 66,672 | 140 |
| *Teacher training* | *132,142* | *651* |
| Primary | 113,297 | 478 |
| Secondary | 7,689 | 159 |
| Postsecondary | 9,980 | 11 |
| Multilevel | 1,176 | 3 |
| **Research facilities** | — | **26** |
| **Total** | **2,640,952** | **21,053** |

Source: World Bank Education Department.
—Indicates not applicable.

## The role of the Bank

There is no single lending priority in the Bank's education sector. Any area of human capital—whether in formal or nonformal institutions, or in any area of management, administration, information diffusion, processing, or research capacity—is a candidate for financing. The strategy for each country is determined, as much as possible, independently and is based upon five broad principles: (1) expansion of basic education; (2) reduction of educational inequalities; (3) improvements in the cost-effectiveness of the transfer of knowledge; (4) provision of required manpower skills; and (5) development of national analytic capacities in management, administration, and planning.

Although exceptions are made, in general the emphasis in low-income countries is on the development of low-cost basic education to lay the requisite foundation of science, language, mathematics, and other cognitive skills. In middle-income countries, where first-level education is already widely available, educational quality is emphasized, and with it the expansion of facilities to meet the needs of an increasingly sophisticated economy. As the absorptive capacity of an economy grows, the priority tends to shift toward providing higher level technical skills, as well as developing skills in science, technology, information processing, and research.

One of the strengths of the Bank, which could hardly be equaled by other inter-



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national development institutions, is its wide experience and its concurrent involvement in a number of development sectors within the same country. This is because development has to be conceived at a multisectoral level no less for an education loan than for a power project. Many factors contribute to a person's growth—among others, income, education, health, nutrition, and fertility.

In the past 18 years, the education sector has helped to create 2.6 million new student/trainee places in approximately 21,000 educational institutions, including 185 university faculties, 651 teacher training colleges, 2,903 secondary schools, and 16,902 primary schools (see Table 1). Eighty-seven countries have requested capital for educational projects, amounting to approximately US$4 billion, with—including national or other external resources—a total project cost of $8.1 billion. But the Bank's education sector is not only concerned with places in schools: 26 projects have helped to establish research and product-testing facilities; 10 have partially funded radio or television broadcasting facilities; and 7 have assisted the development of computer facilities. Assistance has been provided in a number of areas: mechanical engineering (48 projects), fisheries (19 projects), forestry (18 projects), child care (12 projects), and hotel and restaurant management (4 projects) (see Table 2).

The Bank channels its education loans/credits in three principal ways:

- Through direct loans for the education sector, which range from the most general types of formal schooling to the most specific kinds of nonformal teaching; from the simplest levels of education to the most advanced postgraduate specialties.

- Through project and sector-related training—that is, through loans either in education or in sectors such as power and transportation, which include the training of managers and persons to operate and maintain project equipment and machinery. The training of over 2,000 persons by the Training Institute of the Bolivia Railway Project, the training of over 5,000 farmers in carefully organized cooperative training sessions of the Lofa County Agricultural Project in Liberia, and the development of the Kenya Water Resources Training Institute in the Fifth Education Project of Kenya are illustrative of the multitude of project components under execution.

- Through education components within urban and rural development projects. Thus, several rural development projects in Northeast and Central Brazil and elsewhere contain components designed to improve access to and the quality of schools for rural children. Similar efforts to improve the skills of the urban poor are being attempted through projects in Colombia, India, Kenya, and elsewhere.

## Problems; successes

A decade ago, a "good" educational system was interpreted to mean one that provided effective teacher training and sound curriculum development, the latter often being reduced to making the content and delivery of what was taught more "practical." However, the purposes of practical curricula—which taught metal work and carpentry, for example—were not always well accepted, well defined, or well implemented. And quality itself is a broader concept than previously recognized. It includes all elements—chalk, maps, furniture, textbooks, and visual media—required for increased learning; and it requires the measurement of what has been learned. These pose new problems. Specific efforts to strengthen science teaching by placing laboratories in educational institutions often ran into difficulties because of the complexity of upkeep in an environment where chemicals, propane gas, and other ingredients required for demonstrations are at a premium and the supply irregular. Maintenance of equipment has also been a problem, as has, more generally, the strain on governmental finances in meeting the costs of teacher salaries resulting from educational expansion. And there have been problems coordinating training among sectors within both national and international agencies. Duplication of effort is too common.

Protracted problems—such as equipment maintenance—have often been undetected because of the scarcity of on-the-spot information, both about the quality of implementation and project effectiveness. Better information about project results will become increasingly available as current education projects include built-in mechanisms for monitoring and evaluation. Despite these improvements, however, it is fair to say that today neither the Bank nor its borrowers have access to sufficient information to be able to evaluate the effectiveness of these projects properly.

An overriding and long-term problem is that both borrowers and lenders have been preoccupied with individual projects at the expense of the long-range development of national capacities for analysis, planning, and general management. It is not only desirable but essential for the Bank to assist developing countries to build and maintain their capacities in these areas.

It used to be thought—in fact, so widely that it was a truism—that educational systems were politically more "sensitive" than other sectors. If what was meant by this was that educational institutions were more subject to political change, resulting in irreparable disruption, then this impression was exaggerated. The Bank's educational investments have demonstrated an extraordinary staying power in spite of political and economic shifts in the status quo. This is particularly true for secondary education. Secondary schools assisted by the Bank have been found fully operational and fully enrolled after a decade of crisis in Uganda, during a period when the industrial sector and much of the agricultural sector economically broke down. They have been found fully operational after an earthquake, an unprecedented civil war, and a shift in political philosophy in Nicaragua; and found to be functioning normally after a decade of massive starvation and civil war in Eastern Nigeria. Thirty-two secondary education projects have been completed since 1963; and there has yet to be a case of underenrollment.

When there is progress in getting agriculture moving, in managing power plants, and in implementing health and social reforms, the degree of this progress often rests upon the education and technical knowledge of its designers and participants. It is increasingly common now to find that today's managers have emerged from educational institutions or fellowship programs, many of which have been wholly or partially assisted by World Bank funds. The Economic Development Institute (the teaching affiliate of the World Bank), for instance, financed and enrolled some 8,000 middle-level and senior-level development managers in its training activities between 1956 and 1981. The Bank's

Giuseppe Franchini for F&D

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*He has served on numerous boards, including the Executive Board of UNESCO, the International Institute for Educational Planning, and the International Scientific Committee for the Drafting of a General History of Africa.*



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lending for training, too, has increased its share in total Bank/International Development Association loans from 1.1 per cent to 1.4 per cent between 1976 and 1980. The success of economic development across sectors is significantly helped by a firmly founded education system. Strengthening that foundation is our principal purpose. What Alfred Marshall wrote is more true today than it ever was, "Knowledge is the most powerful engine of production."

Table 2
**Curriculum components in World Bank education projects, 1963–81**[1]

| Component | Number of projects |
|---|---|
| **Cognitive skills** | |
| Bookkeeping/accounting | 12 |
| Economics | 4 |
| General science | 70 |
| Mathematics | 33 |
| Reading, writing | 55 |
| **Engineering** | |
| Engineering—automotive | 40 |
| Engineering—chemical | 4 |
| Engineering—civil | 29 |
| Engineering—electrical/electronics | 71 |
| Engineering—mechanical | 48 |
| Engineering—mining | 6 |
| **Health** | |
| Child care | 12 |
| Family planning | 10 |
| Food processing | 13 |
| Health/nutrition | 50 |
| Paramedical | 2 |
| **Management** | |
| Computer and data processing systems | 16 |
| Foreman training | 2 |
| Hotel/restaurant management | 4 |
| Industrial management | 3 |
| Management | 47 |
| **Rural development** | |
| Agroindustry | 5 |
| Community development | 14 |
| Cottage industry | 29 |
| Farm mechanics | 38 |
| Fisheries | 19 |
| Forestry | 18 |
| **Small industry** | |
| Carpentry | 76 |
| Construction—building | 49 |
| Forging, welding, pipe fitting | 180 |
| Galvanizing/plumbing | 22 |
| Industrial production | 44 |
| Masonry | 18 |
| Mechanics—auto | 12 |
| Mechanics—diesel | 5 |
| Metalshop construction | 72 |
| Shipbuilding | 1 |
| Textile technology | 6 |
| **Other** | |
| Electrical installation | 41 |
| Electrical power | 20 |
| Petrochemical/petroleum | 1 |
| Refrigeration/air conditioning | 26 |
| Telecommunications | 10 |

Source: World Bank data.
[1]Each education project is preceded by an appraisal report that describes the project's major emphases. These descriptions frequently include mention of the programs being sponsored within the institutions assisted under the project. When these curricula are mentioned specifically in project appraisal reports, they are coded. This is a list of the frequency with which curricula are mentioned. A total of 224 projects were approved in 1963–81. They are grouped roughly according to area of economic activity for ease of interpretation.

## Education and culture

That certain educational investments (although not all) are able to withstand the vicissitudes of economic and social change is simply an indication of the consistency of what economists call "social demand" and what I would call the aspirations of people the world over for knowledge. The purpose of the Bank—in any of its sectors—is to change people's lives for the better. As a bank we must weigh the economic alternatives of how to do this, and for the most part our analyses, by virtue of the nature of the institution, are confined by the concept of what is most economic. But economics itself is an instrument; it is no more and no less than a scientific measure of the options nations have to select from. What they actually want is a wider scope for choice.

There are two reasons why nations want to borrow for education; these have already been mentioned, but it is relevant to discuss them in more detail. First, most want their own capability, at the very least, to interpret for themselves the pluses and minuses of various ideas—technological, religious, or political—and to partake not only in the application but also in the generation of knowledge among the community of nations. Second, they want education to discover and sustain the fundamental values of their own culture and subcultures. Peoples' values are unique. They may, for instance, be deeply religious. They may believe in the importance of the family, in the virtue of true courage, in civility, in the dignity of the individual, and in the wisdom of age and experience. Their historic music, poetry, and painting are similarly unique. But the arts of the nation and many other traditions, many of them oral, will soon be lost if they are not recaptured in more enduring forms.

That is why nations continue to be preoccupied with setting up institutions and encouraging researchers, local or otherwise, to record their histories in books; collecting and preserving their oral traditions, which for many of them are the only authentic sources of their past; promoting local and national languages as a medium of communication among themselves; and taking steps to safeguard the important sites and centers of their cultural and natural heritage. Nations want to preserve and develop their identity. Historically and at present, the school is the chosen medium—not the only one, of course—for the transmission of such a cultural heritage, its temporary deficiencies notwithstanding.

These two purposes of educational investment may not always be congruent; the need to preserve culture sometimes conflicts with the requirement to enhance scientific and analytic capacity. This problem is universal; every country has to set priorities and every country has to make hard choices in a time of limited resources. But a country's success in meeting either goal uniformly rests upon the degree to which it is able to educate its citizens. The Bank does not invest directly in painting or poetry; it does equip laboratories for chemistry; it also helps countries to generate a capacity to design, produce, and distribute their own textbooks. The Bank, has, for instance, supported 50 education projects that include the production of textbooks and the training of teachers to use them in Africa, Asia, and Latin America. In Thailand, a Bank loan is being used to train teachers to rewrite their curricula. Yet every child who is taught to read and write enhances a nation's capacity to meet both its economic and its noneconomic goals. A nation without a capability of storing, retrieving, and disseminating information or of generating skills will not have a chance for success in meeting either goal. It is no wonder that the demand for this capability is consistently high among countries at different levels of economic development. As long as this demand remains, the Bank will attempt to respond with the capital required to fulfill it.

The challenge of institutions with economic development as their overriding institutional objective is to devise a development assistance strategy with man as the end purpose and the center of their development activities. The next two to three development decades will perhaps reap the fruits, and benefit from the lessons learned and the experience acquired over the past several development decades. FD


**Related reading**

Richard A. Easterlin, "Why Isn't the Whole World Developed?" *Journal of Economic History* (March 1981).

Wadi D. Haddad (coordinating author), "Education," World Bank Sector Policy Paper (April 1980).

Mahbub ul Haq and Shahid Javed Burki, *Meeting Basic Needs: An Overview* (Washington, DC, World Bank, 1980).

*World Development Report, 1980* (Washington, DC, World Bank, 1980).




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# Education as an investment

Cost-benefit analysis applied to education projects in the Bank and elsewhere shows that returns on investing in schools are at least as high as returns from most other types of investment by the Bank in developing countries.

**George Psacharopoulos**

Human capital is created and the quality of human input in production is significantly improved by spending on education. This is why countries, particularly those with low per capita incomes, invest such a large proportion of their budgets on education—and why, when the state does not, individuals do. It is highly rewarding, both to society and to the individual. It is difficult to measure all these rewards; many, such as the benefits to society of a better electorate or a more informed consumer body, though tangible, are quantitatively elusive. But the measurable evidence alone is sufficient to demonstrate sizable financial rates of return to investing in education.

The World Bank made its first educational loan in 1963, after it had been in operation for over 15 years. Since then, 224 such projects of increasing diversity have been financed throughout the world, mostly in poor countries. The Bank's late entry into educational lending reflects the philosophy that prevailed after World War II until the late 1950s that massive financial investment in such physical assets as ports, roads, irrigation, dams, factories, and machines would generate higher output. But experience showed that some countries (like India) responded sluggishly to the aid inflow, whereas some others, particularly the war-devastated countries (like the Federal Republic of Germany and Japan) did very well without as much financial assistance. This apparent paradox pointed to the importance of human capital in economic development. To put it bluntly, no machine can be operated effectively or agricultural project executed properly unless it is appropriately staffed.

The methodology used for evaluating education projects is a much debated issue. For many years, the Bank has been using the "manpower requirements" approach, which identifies the number of skilled people a country needs to reach sectoral growth targets. Because manpower requirements are directly based on sectoral needs for qualified people, often in the modern sector of the economy, the approach tends to lead to investments in higher education and technical curricula. However, the Bank is also increasingly using information on the costs and benefits of different levels of education as a basis for decisions to invest. Typically this approach favors the lower levels of education and general curricula because of their low costs. Deriving costs is a relatively straightforward matter; arriving at private and social rates of return, particularly the latter, seems to pose more problems, both empirically and theoretically. This article will discuss the calculation of rates of return and will examine the results of using them to quantify the profitability of different levels of education in a broad sample of developing countries.

The findings have important policy implications. They show, first, that using the Bank's methodology, returns on investments in all levels of education in the countries reviewed are well above the 10 per cent normally used as a criterion for accepting an investment project. Second, returns are highest for investments in primary schools. Third, surprisingly, returns on education in general arts subjects are often higher than those for technical training, mainly because of the high cost of the latter. This evidence on quantifiable returns also captures some of the more elusive, unmeasurable social benefits of education. Since most women are trained in general subjects, investing in general curricula also brings the wider social benefits of better nutrition, hygiene, and so on that are derived from women's education, regardless

## Estimating rates of return

**Estimates of the rate of return to a given level of education are calculated by comparing the discounted benefits over the lifetime of an educational investment "project" to the costs of such project. Thus, for the calculation of the private rate of return to four years of university education, benefits are estimated by taking the difference between existing statistics on the mean post-tax earnings of university graduates by age and those of a sample group of secondary school graduates. The earnings of the latter also represents the opportunity cost of staying in school. Direct costs are obtained from statistics on a student's out-of-pocket expenditures that are strictly due to the costs of college attendance. Given these data, the rate of return to investment in a college degree compared with a secondary school qualification is the rate of interest that reduces to zero the net present value of the discounted difference between the costs and benefits. A simple equation for the private rate of return is**

$$\text{Private rate of return} = \frac{\left(\begin{array}{c}\text{Mean annual post-tax}\\ \text{earnings of university}\\ \text{graduates}\end{array}\right) - \left(\begin{array}{c}\text{Mean annual post-tax}\\ \text{earnings of secondary}\\ \text{school graduates}\end{array}\right)}{\left(\begin{array}{c}\text{Four years}\\ \text{study}\end{array}\right) \times \left(\begin{array}{c}\text{Mean annual post-tax}\\ \text{earnings of secondary}\\ \text{school graduates}\end{array}\right) + \left(\begin{array}{c}\text{Mean annual}\\ \text{private direct}\\ \text{cost of study}\end{array}\right)}$$

**Note that this formula can be interpreted as the yield of a permanent constant stream of benefits (the difference in earnings appearing in the numerator) over a lump sum cost of projected earnings plus direct outlays (appearing in the denominator). Neither the permanent benefits assumption nor the lumping together of costs are critical in the calculation, since the latter occur within four years and the former extend over several decades.**

**A social rate of return to college education could be calculated in the same way, although earnings should be pretax (as taxes are a transfer from the point of view of society at large) and the direct cost should include the full amount of resources committed per student of higher education, rather than the usually smaller part of expenditure borne by the student.**

of whether these women form part of the labor force or not. Recent studies indicate, too, that primary education has a significant impact on poverty and the distribution of incomes, in addition to being highly profitable.

### Profitability of investment

The rate of return to investment in education can be estimated in the same way as returns to any other economic activity. A given cost is incurred for a number of years in the form of teachers' salaries; the cost of using buildings and facilities, equipment, and materials; and forgoing production while the student is in school. Benefits come in the form of increased production over the lifetime of a person with more education and broader skills.

Because of the difficulties involved in directly measuring the marginal product of labor with different levels of education or the opportunity cost of someone who is staying in school rather than working, earnings are used as a proxy for productivity. Two types of profitability measures are usually estimated, private and social. The private rate serves to explain and predict the private demand for places in certain types of schools. Social rates of return are used as guides for allocating public investments in education. (See the box for the quantitative expression of these costs and benefits.)

The private rate of return estimates the gains made by the educated individual; benefits are represented by the extra value education gives in the form of his or her lifetime earnings, after tax, and costs by the out-of-pocket expenses—tuition, fees, and other incidental expenses strictly related to the extra education received. For example, a fellowship would enter as a negative cost item in calculating the private rate of return to a college degree, and the direct private cost of primary education in a fully subsidized state school would be virtually nil in most countries. By contrast, a calculation of the social rate of return includes the full social cost of education, regardless of whether schools charge fees or not. The benefits (or earnings) are calculated before taxes, since taxes represent a transfer from the point of view of society.

These rates of return are the subject of much debate. Two of the main issues will be mentioned here; in fact, none of the caveats are sufficiently serious to invalidate the method of calculation.

The main criticism is that observed market wages frequently do not fully reflect the social benefits of education because in many countries wages are set by nonmarket forces such as social custom, unions, or employers (such as the government) who do not pay market rates. However, in most situations it is possible to correct for such distortions by basing calculations on shadow wages or earnings paid to people with the same education levels in the competitive sector of the economy. The social benefit of providing extra education to farmers is often not captured in their earnings, so the return is measured in terms of the extra rice or wheat grown rather than in dollars or pesos. The result of a recent Bank survey of farmers' education and efficiency has shown that, on average and other things being equal, farm productivity increases by 7.4 per cent when a farmer has completed four years of elementary education. When this increased productivity is related to the cost of providing primary education, the resulting social rate of return to investment in primary schools is of the order of 30 per cent.

Another criticism of using wages to show the profitability of education is that the difference between the earnings of the educated and the uneducated may well be influenced by factors other than education, such as native intelligence or socioeconomic background. But when these factors are taken into account the net effect of edu-

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Table 1
**Social returns to education by level and country type**
(In per cent)

| Country type | Educational level | | |
|---|---|---|---|
| | Primary | Secondary | Higher |
| Developing[1] | 27 | 16 | 13 |
| Intermediate[2] | 16 | 14 | 10 |
| Advanced[3] | —[4] | 10 | 9 |

Source: Based on George Psacharopoulos, "Returns to Education: An Updated International Comparison," *Comparative Education* (October 1981).
[1]*Developing countries* include Brazil, Chile, Colombia, Ethiopia, Ghana, India, Indonesia, Kenya, Malawi, Malaysia, Mexico, Morocco, Nigeria, the Philippines, Rhodesia, Sierra Leone, Singapore, South Korea, Taiwan, Thailand, Uganda, and Venezuela.
[2]*Intermediate countries* are Cyprus, Greece, Israel, Iran, Puerto Rico, Spain, Turkey, and Yugoslavia.
[3]*Advanced countries* are Australia, Belgium, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, New Zealand, Norway, Sweden, the United Kingdom, and the United States.
[4]Not computable due to lack of "control" group of unschooled.

cation on earnings and productivity is only slightly reduced.

## Some empirical evidence

Several estimates have been made over the last 20 years of educational costs and benefits, and, of course, the resulting rate of return. A recent Bank survey of 44 countries at different stages of economic development gave the social rates of return appearing in Table 1. (The private rates of return are several percentage points higher than the corresponding social rates, as will be discussed later.)

Some salient features emerge from the table. First, the rate of return to investment at any level of education in developing countries is generally above the common 10 per cent normally required by the Bank to justify investment in other economic enterprises. The benefits accrue both to the individual, who is being educated and earns wages in accordance with his or her level of education, and to society, to the extent that the individual's contribution to national income is more than the public resources committed to his or her schooling.

Second, the returns to investment in schooling decline as the educational level increases. This pattern suggests that top priority should be given to investing in primary schools. (It is also in accordance with the fundamental economic proposition of diminishing returns to investments at the margin, and some regard this as an *ex post* confirmation of the theoretical validity of the underlying estimation procedure.)

Third, the same declining pattern is observed across countries at different stages of development: the absolute returns to investment in schools being highest at all levels in poorer countries. This empirical finding has important implications for lending for education projects. It is the poorest countries that need most help in financing their educational systems, because money spent in this way exhibits the highest economic payoff.

The averages in the table hide considerable variations between and even within individual countries. Thus an early World Bank study has shown that the social returns to education in Kenya were 22 per cent for primary and 19 per cent for secondary. A later study in the same country showed that private returns for the same levels were of the order of 28 and 33 per cent. A study on Malaysia showed private returns to higher education (35 per cent) that were even higher than the returns to secondary education (33 per cent)—a deviation from the observed world pattern of declining profitability by level of education. Although social returns to primary education of the order of 82 per cent (Venezuela), 66 per cent (Uganda), and 51 per cent (Morocco) are not uncommon, the social returns to higher education in some countries are rather modest—thus, the Philippines has returns of only 9 per cent, Israel 7 per cent, Japan 6 per cent, Greece 5 per cent, and South Korea 5 per cent. It should be noted, however, that these relatively low returns are observed in countries with more or less highly developed systems of university education. Although one should not jump too easily from association to causation, it is tempting to attribute the high rates of economic growth observed in some of the countries listed above to previous investment in higher education.

The high social rates of return on education are echoed by the private rates. In fact these are higher, because the private rate balances the benefits of after tax earnings against the cost of schooling to the individual, which tends to be below the full cost to the public sector in most countries because of public subsidization of education.

High private returns exist despite the often substantial costs in terms of productive opportunities forgone while the individual is at school. To take the most extreme case, if the state covers 100 per cent of schooling costs, the additional earnings accruing to the educated individual would be obtained at zero personal cost, hence, the educational investment would exhibit an infinite private rate of return. However, the individual typically pays an opportunity cost, although it varies with the level of education invested in, as well as the country's level of economic development. For example, the opportunity cost of someone studying for a doctorate in an advanced country is enormous because the individual forgoes what he or she could earn with a master's or bachelor's degree. On the other hand, there is virtually no opportunity cost associated with primary schools in advanced countries, because there are no employment opportunities for children and because the legal minimum working age is 14. However, the opportunity cost of primary education in poor countries is important because the productive contribution of children to the economy is both legal and substantial, particularly in activities such as agricultural production.

Nevertheless, students and their families continue to show a strong demand for places at all levels of schooling. Moreover, in many countries this demand is unsatisfied. The percentage of applicants obtaining university places is 34 per cent in India, for example; 33 per cent in Brazil; 33 per cent in Viet Nam; 25 per cent in Greece; and 15 per cent in Iran. Such low entry rates are not encountered in countries like the Philippines where most education is privately provided and private demand is almost completely satisfied. The unsatisfied private demand for education and the willingness of families to pay for the education of their children is prima facie evidence that there exists room for investment in education in developing countries.

Tapping private resources has been the typical solution in countries where the state budget is unable to provide as many school places or the kind of curricula the families want. Private schools, from the nursery to the doctorate level, have flourished in all kinds of countries to meet demand. Even where private universities are constitutionally prohibited, as in Greece, the safety valve has been to study abroad—it is estimated, for instance, that one out of every four Greek university students is enrolled at a foreign university at a substantial cost to the country's balance of payments.

## Benefits to society

At one time it was thought that the right kind of education to promote economic development should be of the technical-vocational type. However, recent evidence on the returns to this type of education has cast serious doubts on its value. More often than not, the rate of return to a general curriculum is higher than the return to a technical-vocational curriculum at the same level of education (see Table 2). The reason is that although engineers and technicians earn more, on average, than economics or humanities graduates, the cost of technical education is very much higher than the cost of general education—a fact that depresses the social returns to investment in technical


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education. Of course, this finding does not imply that engineering education should be curtailed. Simply put, it gives a signal that additional investment should go to arts subjects.

This finding also has other implications. The humanities and liberal arts have high female enrollments and are a socially profitable investment for two reasons: (1) the contribution these enrollments make to increasing female participation in the labor force and (2) the well-documented link between the education of women and social welfare factors such as better nutrition and lower fertility. Actually, the higher the level of educational attainment, the greater the participation of women in the labor force. Hence, more education, of any type, enhances the chance that it will be productively used in the market place. For example, in the Sudan the probability that a female will participate in the labor market increases from 8 to 38 per cent if she has completed secondary education. Similarly, in Singapore the chance of a woman participating in the labor force is 21 per cent if she has no schooling, 29 per cent if she has primary schooling, 68 per cent if she has secondary education, and 76 per cent if she has attended university.

Table 2
**Social returns to university education by discipline in selected countries**

| Country | Discipline | Rate of return (in per cent) |
|---|---|---|
| Philippines | Agriculture | 3.0 |
| | Engineering | 10.3 |
| | Economics | 10.5 |
| | Law | 15.0 |
| Brazil | Agriculture | 5.2 |
| | Economics | 16.1 |
| India | Engineering | 16.6 |
| | Humanities | 12.7 |
| Iran | Agriculture | 13.8 |
| | Humanities | 15.3 |
| | Economics | 18.5 |

Source: Based on George Psacharopoulos, "The Economics of Higher Education in Developing Countries," *Comparative Education Review* (June 1982).

But even if educated women never participate in the organized sector of the market (which is the most common case in developing countries), they certainly are economically engaged in agriculture and so-called "household production." What this means is that more educated women produce more and better quality goods and services for the consumption of the members of their household. Such "goods" might take the form of more nutritious meals and a balanced diet, better sanitation conditions, and use of contraceptives. The link between education and fertility has been well documented in the literature of such issues. Other things being equal, more educated women desire and eventually have fewer children.

Table 3
**Earnings differences by educational level and country type**

| Educational level | Country type: Advanced[1] | Developing[2] |
|---|---|---|
| Primary (index base) | 100 | 100 |
| Secondary | 140 | 239 |
| Higher | 219 | 639 |

Source: Based on George Psacharopoulos, *Earnings and Education in OECD Countries* (Paris, Organization of Economic Corporation and Development, 1975).
[1]*Advanced countries* include Canada, France, Greece, Italy, Japan, Netherlands, Norway, the United Kingdom, and the United States.
[2]*Developing countries* include Ghana, India, Kenya, Malaysia, Nigeria, the Philippines, South Korea, and Uganda.

Investment in education, especially at the lower level, also has tangible effects on equity and the alleviation of poverty. In practically every country, labor earnings increase with educational attainment (see Table 3). The provision of universal primary education, apart from being highly profitable, has important egalitarian effects; it pushes people from the illiterate, low-income class into a higher income class. In the same way, higher education increases the supply of graduates, which tends to reduce the existing large income difference between university graduates and other types of labor by increasing the earnings of the latter. This proposition is based on the evidence of what has actually happened in advanced countries following a recent immense expansion in education (compare the relative dispersion of the index in the two columns of Table 3).

Again, the summary picture given in this table masks considerable variation in the structure of earnings between individual countries. Thus, in Ghana, the ratio of university to primary school graduate earnings is 9.1 to 1 and in Malaysia 7.7 to 1. However, in a country like the Philippines with a fairly well developed system of higher education, the corresponding ratio is 2.2 to 1.

## Prospects

The global proposition that spending on education is an investment with a high social rate of return is well supported by the accumulated evidence over the last decade. It can also be confidently concluded that education, especially at the lower level, contributes to the alleviation of poverty, a more equal distribution of income, and an improved social environment.

Although there appears to be considerable room for further investment in educational projects, often little is known about the factors determining the type of investment needed in individual circumstances. One reason for the delay in applying cost-benefit analysis, for instance, is that it requires time-consuming compilation of data. Age-earnings profiles, such as those discussed in the box, have only recently become available for a large number of countries. Several Bank projects now contain provision for the generation of such data in countries where they do not exist or where the Bank needs updated information for its operation. More research needs to be done on returns to educational lending in countries where studies have not yet been made, existing studies need to be updated, and more work needs doing on the relative profitability of spending on different curricula. The economic performance of those engaged in the nonformal or nonwage sectors in developing countries, especially in agriculture and self-employment, has only very recently begun to be seriously analyzed. A Bank-sponsored research program is currently underway to provide information on these and other issues in order to make the lending program more effective.

**Related reading**


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# Improving the quality of education in developing countries

The experience of World Bank projects shows that better quality teaching and teaching tools are crucial.

**Stephen P. Heyneman**

The contribution of learning to economic growth has long been recognized, although the precise measurement of its effects is still subject to debate. Parental demand for educational opportunity, coupled with the economic and political incentives for authorities to supply it, account for the expansion of formal schooling to unprecedented levels. Universal primary school enrollment has now been achieved in 35 of the richer developing countries since World War II, including Argentina, Gabon, Malaysia, and Trinidad and Tobago (Table 1). In the 36 poorest countries (whose per capita gross national product (GNP) was US$265 a year or less in 1975) average enrollment in all levels of primary education increased from 48 per cent of the school-age population in 1960 to 70 per cent in 1977. There are, moreover, about 50 per cent more children enrolled in grade one than in grade four, so this 70 per cent enrollment figure significantly understates the proportion of children who begin school. By the end of this century, every child will probably be able to start school.

The quality of education received by these children is the subject of this article. Typically, primary school teachers in developing countries have few teaching tools, and even these are of poor quality. Their own salaries absorb most available funds. Not surprisingly, despite common objectives in teaching mathematics, reading, and science, their pupils leave school with far fewer skills than do their counterparts in the developed world, who are exposed to schools of substantially higher quality. And yet the Bank's experience shows that even poor education in these basic skills makes for better farmers, better administrators, and better mothers with healthier children. Analysis that attempts to isolate those factors that have the most effect on a pupil's achievement in developing countries shows conclusively that better quality teaching and teaching tools—particularly more and better textbooks—have a substantial effect. As a result, there has been a shift in emphasis within educational investments.

## Poor resources

Perhaps the most serious oversight of educational planners during the 1960s was to bypass the issue of how well schools were teaching skills. This is no longer possible. Schools are asked to transfer an increasing number of cognitive skills and amount of factual knowledge. The mathematics and science taught to primary school students today were, ten years ago, often expected only of secondary school students. Similarly, secondary school students are taught now what before was taught in university or, in some cases, not at all because the field is new.

Yet in spite of the significant advances made in providing places in primary schools, these schools in the developing world generally have poor resources and therefore pass on less effectively than they could the increasingly complex skills required of school leavers today. The education of teachers and the availability of furniture, equipment, and materials are normally well below the standards considered minimal for schools in industrial societies.

In 1977, for instance, there were ten pupils for each available primary school textbook in the Philippines. In Bolivia, in 1978, the monetary value invested annually in furniture and materials in the average fourth-grade classroom was approximately 80 U.S. cents a pupil, one sixtieth of the investment for each pupil in Maryland (U.S.A.) during the same year. In a survey conducted in Malawi in 1979, 1 pupil in 8 was found to have a chair, and only 1 in 88 a desk. Primary schools were without safety standards. Walls frequently collapsed after a rain; roofs had large holes; wind and storms disrupted classroom activity as a matter of course. The normal classroom was dark and stuffy; students sat on the ground, balancing an exercise book or slate on their knees to write. Teachers had no offices, chairs no backs, and stools half a seat. The results of inadequate sup-

Table 1
**Primary school enrollment ratios, 1960–78**

| Country income group by GNP per capita | Number of countries | Gross enrollment[1] (in per cent) 1960 | 1965 | 1970 | 1975 | 1978 |
|---|---|---|---|---|---|---|
| Low income, less than $265[2] | 36 | 48 | 58 | 61 | 64 | 70 |
| Lower middle income, $265–$520[2] | 21 | 59 | 65 | 69 | 73 | 80 |
| Intermediate income, $520–$1,075[2] | 21 | 71 | 84 | 95 | 102 | 107 |
| Upper middle income, $1,075–$2,500[2] | 14 | 85 | 93 | 96 | 102 | 103 |
| **Low and middle income** | **92** | **57** | **66** | **71** | **75** | **78** |
| **High income, above $2,500** | **17** | **114** | **118** | **120** | **120** | **116** |

Source: World Bank, *Education Sector Policy Paper*, 1980.
[1]The gross enrollment ratio is the total enrollment of all students in primary school divided by the population that corresponds to the age group of primary schooling. Over- or under-aged students can frequently inflate the figures, and account for the percentages above 100. See United Nations Educational, Scientific, and Cultural Organization, *Statistical Yearbook 1978–79*.
[2]In 1975 U.S. dollars.



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Table 2
**Allocation for nonsalary school resources as a per cent of total recurrent expenditures, 1978–79**

| | Primary | Secondary | Tertiary |
|---|---|---|---|
| Africa | 3.8 | 12.7 | 13.1 |
| Asia | 8.8 | 13.8 | 22.7 |
| Industrial countries | 14.4 | 14.8 | 25.5 |

Source: United Nations Educational, Scientific, and Cultural Organization, *Statistical Yearbook 1978–79*.

port for educational systems have a negative impact on an economy by reducing the value of the already low investment of scarce resources.

Such inadequate teaching environments are partly a result of the fact that the lion's share of the funds available for education—on average 95 per cent of the money set aside for primary schools—has to go toward teachers' salaries. But paying a teacher to copy from a worn-out textbook onto a blackboard and to supervise its memorization by 50 students is an ineffective utilization of expensive talent. The question is what level of classroom resources teachers should have available to justify their salary. In industrial countries today, 14 per cent of recurrent costs of primary schools are allocated to classroom resources—books, maps, visual aids, furniture, and the like—and 86 per cent is spent on salaries. The average in Asia is 9 per cent and 91 per cent for salaries; and in Africa 4 per cent with 96 per cent for salaries (Table 2). One policy dilemma that developing countries are now confronting with regularity is the minimum standard of resources a primary school should have before new teachers are taken on. Experience has shown that, at a minimum, expenditures on teaching tools should account for approximately 10 per cent of public recurrent expenditures.

The large difference in educational quality between low- and high-income countries is also widening. As more and more pupils enter school there is less available to teach them with. In 1960, the average Organization for Economic Cooperation and Development (OECD) country invested 14 times more for each elementary school pupil than did any of the 36 countries with per capita incomes of below $265 per year. But by 1977 the difference had grown to 50:1.

## Education and productivity

Although conclusive evidence is scarce, it is clear that the poor quality and limited educational materials available in developing countries adversely affect the level of cognitive skills a student can acquire at school. Recent studies show the average student from a developing country scoring at a level that falls in the bottom 5 to 10 per cent of students from a high-income country, and the poorer the country in economic terms, the fewer cognitive skills are acquired by the end of the primary school cycle. Though any comparison—whether between pupils or schools or districts or countries—should be approached cautiously, there is general agreement that achievement is lower in schools in poor countries.

The implications of these results for growth in the developing world are sobering. The general education of a population in science, mathematics, and reading has a significant bearing on the degree of productivity to be expected from it. The link between irrigation-based farming and education is illustrative. There are approximately four different levels of technology involved in irrigation-based agriculture

| Farmer-entrepreneurs technology level | Agricultural inputs | Minimum learning requirements |
|---|---|---|
| **Level A:** Traditional farming *(Techniques passed from parent to child)* | Local varieties of seeds and implements. | Addition and subtraction—not necessarily acquired through formal education. |

Source: Risto Harma, "The Farmer Entrepreneur and His Prerequisite Prior Education in Agricultural Development," mimeograph, World Bank, 1979.
[1]Direction from agricultural extension agents is helpful at any stage, but the essence of a farmer-entrepreneur is his ability to calculate his own production function.



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(see chart). The most elementary is where knowledge and skills are passed from father to son (see chart, level A); little schooling is required here. The second level of technology (B) includes a single modern input, such as fertilizer, whose utilization is substantially improved if the farmer has rudimentary literacy and a knowledge of addition, subtraction, and division. If a farmer has none of these skills, he will have to follow by rote the one-to-one advice of an extension agent—an expensive and comparatively inefficient method of learning. The third level (C) includes several modern inputs simultaneously, such as high-yielding varieties of seed and careful allocations of pest control and fertilizer. Here, having to follow the advice of an extension agent by rote is even more expensive, but for the farmer to take his own initiative requires an understanding of long division, multiplication, and other mathematical procedures; an ability to read and write; and rudimentary knowledge of some chemical and biological principles. The fourth level of technology (D) is the most modern and includes all the above inputs plus tubewell access during the off-season. For a farmer to operate efficiently at this level he needs to be able to communicate in writing, to research unfamiliar words and concepts himself, to understand basic concepts drawn from chemistry, biology, physics, and to have dependable access to new information from print as well as electronic sources. This is the ideal: that every farmer be able to calculate his own "production-function" anew every year and with each change in crop.

Irrigation farming has been used here as a proxy for national development schemes that aim to increase farm productivity by using new technologies in the (C) and (D) categories. For these schemes to be successful, certain minimum cognitive skills are required of the farming population. A lack of understanding or a misunderstanding of the principles on which new technologies are based can result in catastrophic agricultural yields, and harmful side effects as well. Such skills are required no less urgently by the manufacturing and service industries.

Basic cognitive skills are also required if further training in other, often nonformal, areas is to be successful. The Bank's experience has shown that if people are to be able to make the most of technical or on-the-job training, they not only need to spend a certain amount of time in formal education, they also need to emerge from formal education with a sufficient grounding in cognitive skills. Being exposed to 6–12 years of the low quality education provided in many countries may not be enough. Several faculties of engineering have remained up to one third empty—not because of a lack of demand for local engineers but because there has not been a sufficient supply of qualified entrants with the requisite grounding in mathematics and science. This experience has forced the Bank, for example, to rethink the process of manpower planning very carefully and to incorporate a factor of quality in addition to the normal supply figures for numbers of years exposed to formal schooling.

## Textbooks crucial

Since the 1960s, social scientists have been trying to isolate the characteristics most closely associated with achievement in basic cognitive skills. The approach is relatively recent and imperfect; but, though technical caveats abound, it has come to one important conclusion: in wealthy countries much of the learning in school is accounted for by factors not connected with the school environment, implying that additional physical facilities, teaching equipment, and textbooks only help the acquisition of new knowledge a little. But the quality of the physical and particularly the classroom tools in low-income countries is shown to explain three and even four times the differences in achievement that it can in high-income countries. In fact, the poorer the country in economic terms, the larger the impact on achievement school quality seems to have.

The evidence is scarce on which aspects of the educational environment can be expected to have the most impact on student achievement in the developing world. But one conclusion is consistent: higher achievement is associated with the availability of textbooks and other printed materials. Of the 20 assessments that have been made of the relationship between the availability of printed material and student achievement scores, 17 have reported positive effects.

Providing books where there is nothing to read in the schools sounds like a simple undertaking but may entail substantial logistical challenges—the books have to be acquired or produced, stored, distributed, and so on. But there have been successes in the efforts made to improve this aspect of schooling. The Bank's Third Education Project in the Philippines assisted the Government to design new, high-quality textbooks in mathematics, science, and Pilipino. Approximately 97 million of them were distributed sufficiently widely to alter the average ratio of pupils to books from 10:1 before the loan to 2:1 afterward. Average student scores were raised significantly; in fact, the achievement gains in the Philippines were approximately twice the magnitude to be expected in North America were class size to be reduced from 40 to 10. Moreover, the gains from the project were frequently the greatest where they were least expected—among students whose family background and school location have been associated with severe poverty and who came to the school with low levels of knowledge.

Where there are enough textbooks, and the school system has met certain standards of efficiency and good management—as in Algeria, Greece, Ireland, or Korea—the Bank tends to lend for science laboratory equipment, supplementary readers, library facilities, electronic media, or specialized teaching facilities. These too can be expected to increase achievement by significant amounts.

Thus, the demand for educational investment is slowly experiencing a shift in emphasis away from providing places for universal primary education and toward improving the quality of the learning. As far as we can predict, the bulk of the Bank's capital investment in education will continue to assist the expansion of schools, but this proportion is expected to decrease. In fiscal year 1983 it should decline to less than 85 per cent of resources disbursed for education—from 93 per cent between 1975 and 1978. The decline is accounted for by increases in lending for curriculum development, for radio, television, educational administration, and particularly for increases in the development, production, and distribution of learning materials. By fiscal year 1983 the Bank's education sector lending is expected to be $50 million a year in classroom "tools"—up from $1.6 million a year a decade earlier. For example, 5 per cent of education projects contained funds for textbooks in fiscal year 1975; 10 per cent in 1976; and 25 per cent in 1977. By fiscal year 1978 this had risen to 40 per cent. As a result of the Bank's investments, a very large proportion of students have or will

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have textbooks in Benin, Brazil, El Salvador, Indonesia, Lesotho, Malawi, the Philippines, and Swaziland.

### Future policy developments

Two results seem to be emerging in the wake of the demonstrated importance of the quality of educational materials. First, developing countries want to design, manufacture, and distribute their own educational materials, including textbooks. The World Bank has, where it is economic to do so, made loans for printing presses, storage and distribution systems, paper mills, and the training of editors, designers, and production experts. This is the case in both Indonesia and the Philippines.

But this area needs to be analyzed carefully. In some cases, the cost of producing books locally from scratch may be prohibitive and the technical experience, equipment, and raw materials (particularly paper) may be imported more cheaply from Western Europe or North America. The publication process demands substantial experience in editing and production, in printing, testing, and marketing. Six to ten years is normally required to develop a new generation of textbooks for primary school grades one through six. This may, given the availability of the necessary skills, be economic for books on local history, civics, and literature; but it may be cheaper to adapt already published materials in mathematics and the sciences. However, it is often more economic for countries to publish their own textbooks than to print them. Printing in large quantities requires specialized machinery and a constant supply of raw materials and maintenance skills; publishing requires editorial and design skills but not necessarily the local hardware for manufacture.

A second effect of the interest in the quality of education is the increased awareness of the need for equality of educational opportunity within and between populations. There is a standard for educational opportunity today that varies only slightly from one high-income country to the next. In developing countries, however, equal educational opportunity has, so far, meant only a place at school. But when a pupil in Bolivia, India, or Malawi, who must learn similarly complex skills of mathematics or science, has access to only one sixtieth the level of learning resources as the child in Europe or North America, there is no equality of educational opportunity between Bolivia, India, and Malawi on the one hand, and Europe or North America on the other. For the first time in history it will soon be possible for every individual at a given age to have an opportunity to begin schooling. But this is not a sign that equality of opportunity has been reached between nations. Substantial new resources would have to be made available to pupils in developing countries if they are to have anything approaching equality of opportunity with pupils in the developed world after entry in school has been obtained.

This poses a substantial economic dilemma. Should the quality of education in developing countries be the same as that in the industrial countries? Some areas of education—such as electrical engineering, architecture, or computer sciences—are fairly similar in all countries; consensus exists on the requirements for training and the physical inputs necessary to deliver it. This consensus is similar to the agreement that exists on the physical requirements for building a bridge, a road, or a dam with certain specifications. Moreover, minimum physical requirements, and therefore minimum cost standards, are predictable.

Primary and secondary schools also have minimum requirements for achievement in different skills, but there is little consensus on the minimum resources required to provide them. The major industrial countries invest 50 times more per pupil to meet similar curriculum objectives than do certain developing countries. This disparity leaves developing countries with an unenviable choice: establish a ceiling on enrollments; possibly also decrease science and reading curriculum objectives to a level well below those of industrial countries; or increase expenditures on education to provide the quality of resources needed if their curricula are to be efficient. If the latter option is chosen, some consensus must be reached on the level of inputs required and where resources can be found to obtain them. These will be the central issues in most developing countries in the years to come.


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